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*Indian Standard*

METHODS OF DETERMINATION OF  
BULK DENSITY OF COKE

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# *Indian Standard*

## METHODS OF DETERMINATION OF BULK DENSITY OF COKE

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## *Indian Standard*

# METHODS OF DETERMINATION OF BULK DENSITY OF COKE

### 0. FOREWORD

**0.1** This Indian Standard was adopted by the Indian Standards Institution on 18 January 1974, after the draft finalized by the Solid Mineral Fuels Sectional Committee, had been approved by the Chemical Division Council.

**0.2** Bulk density of coke is the mass of coke occupying a unit volume in a container and is expressed in terms of tonnes per cubic metre. This mass varies with the size of coke and the degree of compaction. Coke of larger sizes cannot be tested conveniently and accurately in a small container and it is possible to obtain only an approximate conversion factor by which the bulk density obtained in a small container may be correlated with the bulk density obtainable in a large container. Accordingly, in the case of coke having nominal upper size 150 mm (round aperture), a small container is used for determining bulk density, while in cases where the size is larger than 150 mm and where coke is to be used in large quantities, it becomes necessary to use a large container to get dependable figures.

**0.3** In the formulation of this standard, due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to practices in the field in this country. This has been met by deriving assistance from the following publications:

ISO/R 567-1967 Determination of the bulk density of coke in a small container. International Organization for Standardization.

ISO/R 1013-1969 Determination of bulk density of coke in a large container. International Organization for Standardization.

Further, with a view to making the standard more comprehensive methods for determination of bulk density using a small as well as a large container, have been incorporated in this standard.

**0.4** In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS: 2-1960\*.

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\*Rules for rounding off numerical values (*revised*).

## **1. SCOPE**

**1.1** This standard prescribes methods of determination of bulk density of coke in a small and a large container respectively.

## **2. PRINCIPLE**

**2.1** A weighed container of known volume is filled with coke carefully to substantially prevent breakage. The upper surface of coke is levelled and the increase in mass is determined.

**2.2** Bulk density of coke up to 150 mm ( round aperture ) nominal upper size only, is to be determined in a small container.

NOTE — The nominal upper size is that at which not more than 5 percent of coke is oversize.

## **3. APPARATUS**

**3.1 Small Container** — A cubical container of 2 hl ( 0.200 m<sup>3</sup> ) capacity, of internal dimension 58.5 cm, of rigid construction and smooth inner surface, and fitted with handles.

**3.2 Large Container** — Such as a railway wagon or skip. The container shall have dimensions at least 3 × 2 × 1 m.

## **3.3 Weighing Machine**

a) *For Small Container* — preferably of the platform type, of maximum capacity 300 kg and such that the weighing error does not exceed 0.1 percent of the maximum load or 250 g, whichever is less.

b) *For Large Container* — capable of weighing the container and its contents to an accuracy of 0.2 percent or better.

## **4. SAMPLE**

**4.1** The sample shall be representative of the coke and more than sufficient in volume to carry out the determination in duplicate.

**4.2** In the preparation of the sample representative of the consignment of coke, the method prescribed in IS:436 (Part II)-1965\* shall be followed.

## **5. PROCEDURE**

**5.0 General** — While filling coke into the container no jiggling shall be resorted to.

\*Methods of sampling of coal and coke: Part II Sampling of coke (*revised*).



**5.1 Method A (Using A Small Container)**—Place the container on the weighing machine and note its mass. Charge the coke slowly into the container; the height of drop shall be as small as possible and in any case shall not exceed 25 cm.

**5.1.1** Having overfilled the container, slide a straight-edge across the top of the container, removing any piece of coke which obstructs the passage of the straight-edge. Weigh the charged container.

**5.1.2** Carry out a duplicate determination by repeating the procedure, using a second portion of the sample.

**5.2 Method B (Using A Large Container)**—Weigh the empty container. Calculate its internal volume (capacity) in cubic metres ( $\text{m}^3$ ) to an accuracy of 1 percent.

**5.2.1** With the container on a level surface, carefully charge the coke into it until the whole surface of coke projects above the top of the container. Slide a straight-edge across the top of the container and remove any piece of coke which obstructs its passage. Weigh the charged container.

**5.2.2** Carry out a duplicate determination by repeating the procedure, using a subsequent wagon or skip of similar capacity.

**5.3** Separately carry out determination of total moisture content ( $M$ ) of coke as prescribed in 6 of IS : 1350 (Part I)-1969\*.

NOTE—When bulk density is reported without qualification, it is understood to be expressed on the 'dry basis'. Where bulk density is to be reported on 'as received', 'as sold' or on 'wet basis', determination of total moisture content is not necessary.

## 6. EXPRESSION OF RESULTS

**6.1** Bulk density of coke, on dry basis, expressed in tonnes per cubic metre, is calculated from the following formula:

$$D_B = \frac{m_1 - m}{V} \times \frac{100 - M}{100}$$

where

$m_1$  = mass in tonnes of the container charged with coke,

$m$  = mass in tonnes of the empty container,

$V$  = internal volume (capacity) of the container in cubic metres, and

$M$  = total moisture content of coke expressed as percentage.

NOTE—Where bulk density is to be reported on 'as received', 'as sold' or on 'wet basis', the factor  $(100 - M)/100$  shall be omitted from the above calculation.

\*Methods of test for coal and coke: Part I Proximate analysis (first revision).

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**6.1.1** Report the average of the results of duplicate determinations to 2 significant places of decimal.

## **7. PRECISION**

**7.1** The maximum acceptable difference between the results of duplicate determinations carried out at different times by the same operator, with the same apparatus, on samples from the same consignment of coke, shall not be more than 0.03t/m<sup>3</sup> in the case of Method A and 0.01t/m<sup>3</sup> in the case of Method B.